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ABSTRACT

In today's progressive teaching environment where conceptual learning is key, portfolio assessment helps provide the motivation necessary to involve students in the learning process. The increased responsibility and empowerment of the student, the inclusion of a wider variety of assessment forms such as research papers, interviews, video presentations, and self-assessment, and the disappearance of numerical scores on individual feedback has resulted in very positive results, as indicated by a calculus class taught at Bethany Lutheran College in Minnesota. In the absence of grades, students are less pressured to focus only on high scores. They become more motivated to achieve true conceptual understanding. Exams are not given grades, but constructive criticism. Students must analyze their mistakes, correct them, and turn them in again. Out-of-class projects such as journal entries, career interviews, and Internet research require active learning. This innovative means of assessment, though somewhat subjective and time-consuming, provides more of a challenge than traditional instruction and allows students to see their progress throughout the duration of the course. The increased skills of and positive feedback from students proves its effectiveness in improving the learning process. (YKH)

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Generating More Light Than Heat

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JC 980 109

Generating more Light than Heat

Contributed paper for AMATYC conference in Atlanta, GA

Interactive discussion on same topic - November 16, 1997

ABSTRACT:

Assessment in the classroom has gone through a major overhaul along with pedagogy reform. A portfolio is now center stage for assessment with a much greater degree of student involvement at all levels. Three major differences have made the largest impact: the empowerment of the student with the change in responsibility, the inclusion of a wider variety of assessment forms such as research papers, interviews, video presentations and self-assessment, and finally the disappearance of numerical scores on individual feedback. While this project is in its initial stage with improvements made constantly, the benefits indicate that this new direction has promise for the future.

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Generating more Light than Heat

Alternative forms of Assessment

Six years ago, a consultant from Alverno College presented a workshop on critical thinking and active learning. I remember during a conversation on the side hearing about their radical assessment which involved portfolios, video presentations and self-assessment. What shocked me even more was the fact that this college did not assign grades! Ludicrous, I thought. What kind of wimpy program was this? How could you possibly hold high standards without the pressure of grades? I brushed the concept off as a totally worthless idea.

Now, here I am several years older and wiser, and the only faculty member at my institution to use portfolios. So what happened, and has the change been beneficial?

There has been a great deal of reform recently, much of the movement related to pedagogical issues. Lecture is out as the sole means of transmitting information. Cooperative learning, writing, technology and laboratories all enhance a curriculum aimed at conceptual learning through discovery methods. When I think back to my college days and then consider my own classroom; well there is just no comparison. During this time, I have attempted to blend the old with the new and find a combination that works well for my situation. The exams, quizzes and homework that is assigned have changed accordingly. The questions are more conceptual and less manipulation. Challenging assignments that we call problem sets are more discovery-oriented or extended applications. Symbolic manipulation has become only one method of analysis, with a heavier emphasis on tabular, graphical, and verbal data. So in this sense, assessment has changed. Ultimately, this didn't seem like enough. While the style of questions has improved on a microscopic scale, the macro view contained the same elements from years past.

Research through such mediums as the PRIMUS journal, publications put forth by NCTM, and the internet have led me down a new path. Now a student portfolio is the center of assessment. While many of the elements remain fairly standard, the focus and thus results have shifted. Three major differences have made the largest impact: the

empowerment of the student with the change in responsibility, the inclusion of a wider variety of assessment forms such as research papers, interviews, video presentations and self-assessment, and finally the disappearance of numerical scores on individual feedback. These changes have been made in many levels of mathematics classes, from beginning algebra to calculus. The comments made in this paper primarily stem from first year calculus due to my own personal prejudice. Success has been similar across the board.

Typically grades are viewed as a "brand" burned onto the student by the instructor. During a recent conversation via e-mail, an Ohio State University professor stated the following:

> "My experience is that students are far too grade- and score-conscious, to their detriment. I see students laboring under the misconception that a score, a grade, or a diploma will somehow open doors for them, regardless of how much or how little they understand the underlying material. Worry about being genuinely curious about how things work, and learning that. Scores, college admissions, and all the rest will surely follow."

My feelings exactly! But while I thought I was conveying this to my students, somehow it never really sunk in…and no wonder when grades are the impetus for any learning. I became frustrated with top notch students, especially those who were seeing the material for the second time, performing at a minimum level to get the grade that they desired. Is it possible to get these students to push themselves without losing the remainder of the class? How can I get students to cut the cords that attach them to grades, yet still get them to strive for high quality work? By placing the student in the driver's seat, the control shifts from instructor-assigned grades to allowing the student to justify their level of skills. This empowerment has an incredibly strong effect on the student. No more whining or excuses! Movement from "student as subject" to "student as self-assessor" creates an environment where learning is intrinsically valued. Since the motivation is coming from within, all work becomes more meaningful. This in turn is producing more thoughtful and interesting responses. My role has shifted away from the one who is placing pressure and heat on students to perform. Now it has become more of the one

who is using a flashlight to guide the students into finding their own way through the forest, and ultimately handing off the flashlight to the student. Rather than the feeling of getting burned, students instead are saying "Ah-ha; now I see".

The portfolio is not a new idea, and it certainly is not a precursor to using alternative assessment forms. However, re-thinking is generally tied to re-invention. As my overhaul of assessment developed, more creative forms of assessment began to take form. While exams, quizzes and problems sets play their role in the portfolio, you will also find journal entries, career interviews, research (including work done using the internet), videotaped presentations and self-assessment. The time, effort and **thought** put into these segments are amazing! Students become actively involved and engaged in the course, which research has shown improves learning and retention. Many of these are assigned as out of class projects. Thus the time put into them is substantial. So how do students find the time? They make the time because they are interested and have learned to put their heart and soul into the class in order to make it a meaningful part of their education. Even I was surprised the first time I assigned a career interview. Yet many students commented that this made a huge impact on the direction they were taking. Another surprise came as the self-assessment was read. I anticipated surface or standard answers in part. What does the teacher want to hear? However, mostly the responses contained insight that I do not typically see in this group of 18-20 year olds. As part of the self-assessment process, students are asked to assign themselves a grade and I take this very seriously; however, they are fully aware that this is subject to change upon consultation with me. Despite many attempts to curb the habit, I still will occasionally (especially early on) have a student grade too high with the justification relating to the time spent or improvement made instead of the results created. Old habits die hard!

Perhaps the most radical change that I have made is that of grades themselves. Students no longer receive a numerical score on each assignment or test. Instead a system of constructive verbal feedback is used. Numbers may on the surface appear the most natural choice for a mathematics course. Even my students recognize that they typically glance at the score on the top and ignore the rest. Isn't this counterproductive to education and learning? Now they must carefully analyze all the comments that have

been made and correct all mistakes. My tendency to correct their mistakes for them is being curbed as I recognize the benefit of providing gentle pointers so that they must learn to discover their own mistakes and ways of fixing them. Two questions may arise at this point: doesn't this take forever, and isn't this too subjective? In fact, I have found that writing comments is no more time consuming than assigning points. No time is wasted trying to decide how many points each question should be worth, or looking through previous papers to see how many points I awarded for a similar solution. My time is better spent producing comments that impact student learning. Due to the slightly shortened time spent, papers are returned to the student more quickly which is another benefit. There are occasions where the time spent is intensive; for instance at midterm and finals when I review the entire portfolio. I keep comment cards on each student, yet even just glancing through these works for organization and structure is time consuming. In response to the question of subjectivity, I have to agree. It is somewhat subjective. However, I challenge you to find an effective means of assessment that is completely objective. It is crucial that students understand what constitutes top quality work. Open discussions and written expectations along with examples of various levels of work lower confusion on this issue. In certain courses (usually lower level) I will assign some grades to the first few items so that students get an even better taste for how their work stands up to the ideal. Soon I drop this practice and they are flying solo. So far getting students to judge work themselves hasn't been a problem. Instead of keeping a spreadsheet with lists of numbers, I now use computerized note cards with comments to maintain a record of progress. While work will be turned in again as part of the portfolio, the cards save me time over reviewing tons of documents. This may seem too radical for some, but it works well for me. Better yet, the students learn to appreciate these new methods.

As this is relatively new for me, I do not have compelling statistical figures to substantiate the results of the changes. My students took an exam from years past and scored very well, with comments about how easy (and boring) it appeared. Also, students that have graduated and transferred to other institutions inform me that while they are often frustrated at how the new classes are taught, they feel well prepared (even C students). Others who have friends taking a similar class at another college are amazed at

how simple those classes appear compared to "how tough they had it". Upon completion of the semester, an anonymous evaluation form about the portfolio system is distributed. Below you will find some representative responses:

1) Give specific examples of how your learning has been affected by the use of a portfolio.

"Using a portfolio gives you the chance to go back to work that you have done, and rethink it with the new knowledge that you have gained. It is more difficult, and it takes more time. It requires a further devotion to sticking with a problem until the conclusion. I've heard it said that 'writing is never finished - it is only abandoned'. The same applies to portfolios and mathematics - it takes work, asks further questions, and adds that extra step until it is finally laid to rest. Perhaps it adds a much needed step to the learning process of such a difficult subject as calculus."

"...and I think the biggest way learning has been enhanced is that I had to find the motivation to learn from within. So I took more pride in my learning."

"Having everything saved and ready at your fingertips is a major plus. Having to hand back in corrections from any work makes you think critically about what you did wrong and how it needs to be fixed. All in all, the portfolio makes me a better calculus student by providing me with a fuller knowledge."

2) Most difficult aspect of using portfolios.

"Well, you have to actually keep track of your assignments instead of throwing everything away."

"We aren't used to thinking about our thought process, and evaluating the progress we've made, so that is harder to do."

3) Option of grading with comments, corrections and feedback vs. standard grades...

"What irritated me most about high school classes is the lack of feedback that you get from your teachers. You can work for a week on a paper, get it back, and it will say: 'Good Points A+'. It feels like as much disrespect as you can handle - although I sympathize with teachers who have heavy class schedules, and too many students. I think feedback is 50% of what education is all about."

"Numbers and grades are nice and all but I like constructive criticism far better. Also it is a form of communication between you and me about what I am doing in calculus. The class has become more fun because we now know you better and where we stand in the class. With standard assessment a student can just come and go and have no real involvement with the class."

"I have noticed a change in myself since we began this grading system. This semester I have been more confident. I have only had to think about whether I understand the material and not the percentage I need to get an 'A'. I want to understand this stuff. I want to do well in this class. For those reasons, I have worked harder this semester than I did last semester. Calculus has become a part of my life, not just a 5-credit grade. I found that a positive comment on a paper is more reinforcing than a letter grade, as well as being significantly more personal. This approach has led me to work harder to succeed and develop my potential. I don't depend on a letter to tell me I have learned; I rely on that sense that I get when things start to come clear. This feeling of accomplishment inspires further work and further accomplishment!"

The proof that I see in the improved attitudes, work and thought level, conceptual understanding, commitment to the class and retention of the material is all I need to encourage me to continue down this path, making changes as I learn from my own mistakes.

A short segment from my syllabi regarding the structure of the portfolio is given below. Also in the syllabus, there is a convincing (lengthy!) argument for the new grading system and a description of levels of mastery. The criteria is developed for specific objectives and every piece of work, including explanation of process, development of mathematical ideas, clarity and mastery of concepts demonstrated, etc. Since most of what is said the first day of class never sinks into even short-term memory, I run through the basic necessities, briefly describe the style of the class, and then assign the syllabus as reading with a short quiz the second day. This allows me the time to begin some sort of discovery activity that more aptly sets the mood for the semester. It also requires the student to put some time and thought into understanding how things are

going to be run. This avoids "surprises" from coming up later in the semester. ("Really…the final is cumulative? I didn't know that!") Part of the syllabus states:

Your portfolio will demonstrate to you (and me) your progress and level over the course of the semester. As we chart your development, organization will be crucial. The portfolio will follow this format:

I. Table of Contents

II. Course Syllabus

III. Mathematical Autobiography (incoming, then outgoing)

IV. Final Self-Assessment, including critique of your own portfolio

V. Best and worst entries

VI. Mid-term assessment

VII. Weekly journal entries

VIII. Problem Sets - generally challenging questions that involve discovery, application and/or extension of ideas. All problem sets must be typed. Special problem sets include an interview and a video tape of an oral presentation. It is expected that you devote a good deal of time and effort on these, and that they are professional in both style and content. Do not underestimate the time involved! Start the day they are handed out, and work diligently to get them accomplished.

IX. Quizzes - each with the corrections on a separate page following the quiz. All corrections will be due one week from the time that the quiz is handed back.

X. Exams - again with corrections that are due the following week.

XI. Homework

XII. Notes

While I do not correct the homework (or notes), I have found that students place more effort in these areas when they are part of the portfolio.

The switch to portfolios is one I am very pleased with, and I will continue this until I find something even better. The grading issue is more complex and certainly more questions than answers are raised. The feedback has been beneficial for my students in so

many ways. Can freshman and sophomores really learn to value learning for it's own merits in a semester? Clearly the changes have made an impact from the student comments. I am opposed to bribery, labeling, and any form of using grades as punishment or the main incentive to accomplish a goal. However, our society is deeply submerged in a system of rewards, and getting student's comfortable with this is not necessarily a bad thing. I see value in helping student's to recognize that when they really work diligently and master something there will be a reward for doing so. At the same time, I want the student to gain inner pride for their accomplishments and to value learning for themselves, not for me. With the de-emphasis on grades, constructive feedback, placement of responsibility for learning on the student, and self-assessment along with high standards and expectations of true understanding and application, we are currently at a much better position than a few years ago. Room for improvement is always there, but the direction feels right.

As new standards are introduced and reform efforts continue, the need arose for an adjustment in my assessment to fundamentally change the relationship between student and assessor. Using portfolios along with more innovative forms of assessment has brought my classes closer to an atmosphere of true education. The portfolio places the student in the driver's seat, and with this comes a sense of responsibility for their own learning. The additional forms of assessment create more interest and encourage a closer tie between the life of the student in and out of the classroom. Finally, the switch to comments reduces anxiety and focuses the student on true learning and mastery. A college-wide student survey pointed out that Calculus is considered the most challenging course on campus. This may not be surprising to any of us. What may shock you, however, is the fact that it also ranks as one of the most fun courses offered! Challenging, yet fun - could that be? The students report that it is so. More importantly, the changes in assessment that have been made also make this course a truly meaningful part of any student's education.

Julie Kjeer